BULLETIN

OF THE

MADRAS GOVERNMENT MUSEUM

EDITED BY THE DIRECTOR OF MUSEUMS, MADRAS

THE GLACIATIONS AND THE PREHISTORIC AGES

BY

M.D. RAGHAVAN,

Retired Personal Assistant, Government Museum, Madras
Ethnologist Emeritus, National Museums of Ceylon and
Former Head of the Department of Anthropology, Madras University

---

New Series - General Section Vol. X No. 1

Published by

The Commissioner of Museums,
Government Museum, Chennai - 600 008.

First Print : 1966 AD

Reprint : 2002 AD

Number of Copies : 1000

©
Commissioner of Museums
Government Museum,
Chennai - 600 008

Price Rs. 20/-

Printed by
Chennai Printers Industrial Co-operative Society Ltd.,
Chennai - 600 005

Dr. R. KANNAN, Ph.D., I. A. S.,
Commissioner of Archaeology and Museums,
Government Museum,
Egmore, Chennai-600 008

Phone : Off : 8261578
Res : 4341209
Fax : 8218735

FOREWORD

In the migrational history of Mankind, 'Glaciations', popularly known as the 'Great Ice Age', has played a pivotal role in triggering the Homo sapiens to adopt various modes of material and non-material culture in order to adapt themselves to the changes in the global environment.

Thiru M.D. Raghavan, a leading anthropologist in his monograph titled, "The Glaciations" has presented a picturesque description of the period of glaciations, with particular reference to the history of Mankind in a lucid style.

This book out of stock for a considerable period of time has been in demand by scholars. It is reprinted with funds sanctioned by the Government of Tamilnadu. I hope this work will be received well by the academicians and the professionals as well.

CHENNAI-6000 08
15-3-2002 AD

(Dr.R.Kannan,Ph.D., I.A.S.)

CONTENTS.

	PAGE
1 Introduction	1
2 Geological time-chart	1
3 River deposits	2
4 Cave deposits	2
5 Culture phases	3
6 Glaciations	3
7 Pre-Pleistocene glaciations	6
8 Climatic changes	8
9 Extensions in Asia	8
10 Inter-glacial stages and Palaeolithic culture phases	9
11 The Mesolithic	11
12 Glaciations and Prehistoric cultures in Asia	13
13 Prehistoric Culture of South India and Ceylon	15

THE GLACIATIONS AND THE PREHISTORIC AGES.

By

M. D. RAGHAVAN.

It has been a most difficult problem to decide in what geological period, man is distinguished as a tool making and tool using animal. The story of the successive stages of prehistoric cultures, is not yet revealed for all the known parts of the world. Geological and prehistorical researches in Europe have advanced the bounds of prehistoric knowledge of Europe and have enabled us to define the successive stages of prehistoric cultures, which form the basis for the prehistoric researches in other parts of the world. The study of European prehistory is therefore of importance to students of prehistoric archaeology. Evidences of orderly development point to a succession of cultural developments and progress in human arts and crafts.

The Stone Age is one wide-spread over the earth's surface. Almost wherever you go, you find traces of artifacts in stone. It is important to be able to diagnose the implements we come across, to assign them to a definite cultural period, to be able to say to what general period of culture, a given series of implements belongs, in terms of what is already known. European archaeologists have arrived at a sequence of cultures, the one distinguished from the other. This enables us to deal comparatively with the material collected; to compare with the well known European artifacts. We no doubt have to allow for local variations for peculiarities, characteristic of the locality or the culture of the local inhabitants.

GEOLOGICAL TIME-CHART.

We get stone implements on the surface of the ground as at some of the sites in the neighbourhood of the Red Hills near Madras. These surface collections when studied with the known implements give us an idea of the geographical distribution of types. But such surface finds afford little evidence as regards the type of culture they belong to. It is upon evidence supplied by the implements found in geological strata that the science of prehistory has been built. Geology is of prime aid to archaeology. The geological aspect provides the best evidence to base anything relating to cultural periods. The geological time-chart presents in chronological sequence, the order of events during geologic times. as recorded by the stratified sedimentary rocks. Geologic time has been divided into five major divisions or Eras-, the Cainozoic of Tertiary, the Mesozoic or Secondary, the Palaeozoic or the Primary and the Precambrian (Proterozoic and Archeozoic) and the unrecoverable earlier ages.

Each of the Eras is further divided and subdivided into Epochs, characterised by its own distinctive climate and different forms of life. These latter sub-divisions can be correlated with prehistoric cultures.

We must keep in mind the progression of geological periods and the zoological characters of the successive periods. The Mesozoic was pre-eminently the Age of Reptiles of enormous sizes and of numerous forms, unlike the small creatures that now creep on their bellies. In the Eocene and the Oligocene we have the first indications of the ancestral mammals from which man himself has evolved. In the Miocene, the apes have developed further, leading to the higher periods. It is doubtful if man as man existed in the Pliocene. In Pleistocene we are on firmer ground, and there is no doubt of man's existence. Holocene is recent, in which conditions are very much the same as they are today

RIVER DEPOSITS.

Geological deposits furnish the very best evidence of the relative antiquity of such objects, the most important material being old alluvial deposits, left by the rivers in their dried up beds. A river changing its course leaves behind deposits high up or all down the sides of the valley, the oldest being at the top of the sides, the more recent ones in sequence down the slopes. The river gradually lowers its bed, still depositing and carrying away, leaving behind some of the deposits. When such deposits are found containing stone implements, we can place them in chronological order, affording a definite means of establishing their antiquity. In an undisturbed deposit we get a horizontal strata. If the deposit is in irregular strata, we can infer that there must have been some sort of subsidence, in which case we cannot be certain of the evidence. If we deal with one alluvial deposit, those at the bottom are earlier than those at the top. Where there are more than one deposit, and not in regular strata, those at the top may be more antique than those at the bottom.

CAVE DEPOSITS.

Caves may deposit a lot of debris either by action of rivers or by deposits falling from the roof or tops of the caves, or deposits may be left by the occupants of the caves, whether beasts or men. Caves once inhabited by man and since sealed up are of great importance, exposing various strata of accumulations and when we find implements in such deposits, we can assign them to different cultures, providing evidence of chronological relationship, differentiating the cultures one from the other. It is on this chronological sequence of early times that the early history of mankind has been made out.

Sometimes these deposits may get inverted from their original position by the upper portions getting disintegrated and shifted down, thus displacing the position, the lower layers getting on the top of the older ones, actually reversing the order. Deposits thus mixed up do not give valuable evidence.

Certain implements may be found patinated. Patination within certain limits gives indication as to the antiquity of the implements Nevertheless it is not safe from the colour alone to conclude that one is older than the other. Patination though valuable to a certain point, should therefore be used with caution.

The surface which an implement presents may also be an indication of the age—the degree to which the edges are abraded. Abrasion is partly due to the implements being carried on by the river currents and partly due to the scarring of surface by sand.

CULTURE PHASES.

It is from implements in undisturbed deposits that the chronological sequence of cultures has been built up, giving us a series of culture phases from the earliest date of the Stone Age to its end. The sequence of cultures thus built up has taken a very long time to arrive at The beginnings of the evolution of the study of the stone implements may be traced to the 16th century, and has been well established by the end of 18th century. The Palaeolithic period of Europe roughly coincides with the period of the glaciations in the Pleistocene epoch

The varied forms of human life and their associated cultures in Europe in the Pleistocene must have had a prolonged experimental process The Pre-palaeolithic must therefore have been a period of very long duration, and the art of making stone tools must certainly have been developing in the earlier Miocene and Pliocene periods During this experimental stage it is very difficult to distinguish natural products from hand-made ones The lower implements in the river beds, were subjected to a great deal of pressure, and must have resulted in producing implements by the natural process of the edges coming off in flakes. There will thus be difficulty in drawing the border line between tools made by human agency and those produced in nature. The discoveries of Reid Moir in the Pliocene and the Miocene deposits of East Anglia and Suffolk have brought to light what are considered to be traces of early man in the shape of rude implements definitely artificial in character They are believed to represent the dawn of the Stone Age of Man, and these are therefore termed eoliths Though no fossils of human form have been found, these eoliths are now considered to testify to the presence of man during the Pliocene in this part of England. The Pliocene in Europe was an age of transition from the close of the Age of Mammals to the beginning of the Age of Man The warm climate of the Age of Mammals began to change, the climate began to be cooler introducing the Ice Ages of the Pleistocene

GLACIATIONS.

Students of pre-history are so much accustomed to connect glaciations with the Pleistocene, that it is necessary to remember that glaciations have

been known to occur all along world's history. The phenomena of glaciations show that the climate of the earth constantly varies within moderate limits. Despite these severe climatic changes the continuity of life has not been imperilled, for the water of the earth has been neither wholly evaporated during the warm period, nor fully frozen during the Ice Ages. The Ice Ages were a severe resistance test for all plants and animals, the most vigorous and hardy species alone surviving. These short spells of stress and strife, with the warm intervals, between, were nevertheless of ultimate benefit to all forms of life. After the Permo-carboniferous glaciation, the reptiles multiplied and swarmed the earth. After the less intense Eocene refrigeration, the mammals flourished and replaced the giant reptiles. During the course of the Pleistocene glaciations, humanity was the dominant form of life.

Glaciations do not follow a regular plan in the scheme of the universe but are haphazard in the manner of their occurrence.

During the end of the Palaeozoic, India, Africa, Australia and South America developed great Ice Ages, while Europe and North America were almost unaffected. In the Pleistocene, while Europe and North America were half covered with Ice, other continents almost escaped.

In northern parts of Europe and North America, the impress the Pleistocene ice sheets left, are well preserved and can be well studied

Of existing glaciers three kinds are mentioned; (a) mountain glaciers of perpetual snow occurring over the lofty mountain ranges, as the Himalayas. These when they flow down the valley get melted; (b) Piedmont glaciers, where mountain glaciers on reaching the valleys spread out as a sheet over the level ground as on the Alaskan coast, and (c) Continental ice sheets, not associated with mountains, but may begin at low levels and spread out, as are found in Greenland and the Antartica.

The idea of solid ice moving like a plastic body is not easy to grasp. Ice sheets were therefore generally thought of as moving down a slope like mountain glaciers. It is now clear that what directs the movement of an ice sheet is the inclination of its upper surface; the movement does not necessarily depend on the topography beneath, though ridges of rocks or valleys direct the motion of its lower layers. An ice sheet in motion can carry heavy loads though moving only a few feet a day and it leaves its impress on any region it has traversed. The centre of the ice stream moves faster than the sides which lag behind impeded by the rocky edge

Glaciers scour the valleys they spread over Crevasses open beneath the load Fragments of rocks slip into them, and are caught in the narrow fissures. Such blocks of rocks are firmly held and act as tools to grind and striate the rock surface beneath. Finer particles serve as polishing powder to give a smooth finish to the work. The smooth and the striated surface left

by the action of the ice, is one of the most satisfactory proofs of glaciations. These blocks of rocks which thus act as tools in the polishing process, are themselves abraded, shaped, polished and striated and such striated stones found on different sides, are characteristic results of Ice work. Typically glaciated stones are the best evidence of ice action. In the *grinding process* of rock surfaces, particles of all sizes from dust to boulder are caused by the glacial mill, and when the ice finally melts, the whole unassorted material is left as what is called a *till*, often called boulder clay. An ancient " till " consolidated to rock is a tillite and such tillites, constitute the best proof of ancient glaciation.

The marginal phenomena that are of interest in the glaciation are the terminal, lateral, medial and interlobate moraines, heaps of boulders with comparatively little sandy matrix. Banded layers of clays are also deposited in lakes, coarser and finer portion alternatively, showing the slow settling down effect These afford corroborative evidence of glaciation Boulder conglomerates containing angular or rounded blocks of large size are strongly suggestive of the work of ice. The variability of the thickness, structure and composition of the deposits is another feature of glacial action. A large scale refrigeration has an extensive field of bouldery deposits, and a wide area of tillites Where such phenomena are found on neighbouring continents, the glaciation is of sufficient extension to constitute an Ice Age

Old formations of glacial deposits are also likely to be obliterated, metamorphic changes obscuring the record, or buried under later formations. Absence of evidence of glaciation does not therefore necessarily follow that no glaciation took place.

The term " drift " is used to cover all deposits formed by the Pleistocene ice sheets which *include* boulder clay, moraines and stratified *material* in lakes. Parts covered by the Pleistocene glaciation are relatively small in the Southern hemisphere. The Northern continents provide great land surfaces for ice sheets to form in sufficiently high altitudes, and the drift covered areas are chiefly found in the Northern hemisphere.

It was for long supposed that during the glacial period a vast ice cap radiated from the North Pole, extending Southwards. A consideration of the distribution of the glaciations makes such a presumption untenable The ice has rather advanced from certain local centres, expanding in *all directions.* Some of the coldest parts of Northern hemisphere such as Siberia and Alaska were but little affected, while Northern Europe was buried under ice as far south as London and Berlin.

Most of Canada and central and eastern United States were covered as far as the Mississippi. Including the still ice covered regions of Greenland and

the Antartica, more than 12,000,000 sq. miles of the earth's surface or one fifth's of the total land surface of the globe was glaciated. All this, however, did not occur at the same time. With about 6,000,000 sq. miles ice covered regions at present including Greenland and the Antartica, it is claimed the world is not yet out of the Pleistocene Ice Age.

PRE-PLEISTOCENE GLACIATIONS.

Of the Pre-pleistocene glaciations, we need concern ourselves only with the late Palaeozoic glaciation. The Palaeozoic comprises a larger period of world's history than the Mesozoic and Cenozoic combined. Glaciations have been suspected in all its sub-divisions, the last of which appeared at the beginning of the Permian, commonly called the Permo-Carboniferous Ice Age. Except Eurasia and N. America, all the Southern continents were covered with vast expanse of ice including the tropics and warm temperate regions.

It is remarkable that the first discovery of this Ice Age was in India followed by discoveries in South Africa and Australia. The Geological Survey of India in 1859 first reported of a glacial deposit in the Talchirs of Central India [1]. This first discovery of this glaciation within the tropics puzzled the discoverers. The Talchir group of rocks was described as consisting of three parts, at the bottom a boulder bed, followed by fine sand stone, on which rests a blue, nodular shade the whole having a thickness of 500 or 600 feet.

It was not until 1872 when Fedden [2] discovered typical striated stones in the tillite and a striated surface beneath the boulder clay that the final evidence was available that the glacial deposits of the Talchirs were due to the work of ice. R.D. Oldham [3] has among others given the most complete accounts of the Talchir The glacial beds are appropriately described as "mud stones" enclosing large and small boulders of various kinds. In the Upper part of the lower Gondwana series are found bones of primitive reptiles and amphibians, showing that vertebrate life had returned to the region after the departure of the ice. Similar boulder clays were discovered years after in the Salt Range of the North West of India. The fossil plants and marine shells found

[1] Wadia D. N. Geology of India. 1938 Ch. IX—The Gondwana system—The Permian glacial epoch—P. 112; Talchir Series, from the first recognition in Talchiar, District of Orissa—pp. 117×120.

[2] Fedden, Francis; The Geology of The Kathiawar Peninsula in Guzerat, Memoir, Geological Survey of India, Volume XXI, P. 164.

[3] Oldham R. D., A Manual of Geology of India and Burma, Volume II, Third Edition Revised and Enlarged by Sir Elwin Pascoe, Delhi, 1959. Ch. XXII—The Gondwana system of the Peninsular Region I—Talchir Series pp. 901-932.

have greatly helped in solving the question in favour of a late Carboniferous age of the tillite, comparing favourably with the corresponding beds in South Africa and Australia.

The glaciated area is considered to extend from South to North from the Talchir glacial deposits to the Salt Range tillites about 1,100 miles. The whole region is presumed to have been ice covered. The glacial deposits belonging to the same age found in Africa have proved to be more extensive than those in India. The greater part of South Africa and southern end of Madagascar were covered. The ice is supposed to have moved westward from land now submerged under the Indian Ocean. The evidence of expansion points to a southerly direction.

Australia towards the end of the Carboniferous was widely glaciated, with long inter-glacial periods between. Glaciation in Australia seems to have begun much earlier than in India and South Africa, but seems to have ended at about the same time.

Evidences of the same glaciation have been reported from South America where reptilian remains have also been found related to those in South Africa —which suggests land connection of some kind by way of the Antartica

Connected with Permo-carboniferous glaciations and the interrelations observed between India. South Africa, Australia and South America, is the idea of the Gondwana land, a name which comes from the Gondwana series of Indian rocks, with the Talchirs as its lowest member. Such a land mass connecting India, South Africa and Australia was conjectured to account for the occurrence of peculiar cold climate flora such as *Gangamopteris* and *Glossopteris* flora, and other related features in the three glaciated regions round the Indian Ocean of India, South Africa and Australia. To this was included South America following the finding of glacial beds and *Gangamopteris* flora in South America. Such close parallels in the flora and fauna and the Carboniferous glaciations, could only be accounted for on the basis of a single land mass. Including India, most of Africa and South America, the Antartica and most of Australia, such land would be larger than Eurasia at present. The ill-fated Scott's expedition discovered the extensions of this continent with its flora to within 300 miles of the South Pole which shows that the climate of the Antartica must have been in those ages considerably warmer.

The resemblance between the structure of South Africa and of Peninsular India has long been a striking feature. Since the Carboniferous period both have remained geologically undisturbed. Each is a table land The more recent marine deposits are found deposited at a lower level around the lofty table mountains in both The recognition of such elementary features led to the theory of the continuity of South Africa, a theory which has since found much corroboration.

CLIMATIC CHANGES.

The glaciations not only banished all life from the area covered but the climate of the adjoining territory was also changed, the icy winds flowing from the surface of the snow, chilling the neighbouring regions. The climatic changes which produce glaciations are deliberate and slow, and the advance of the ice is equally slow. This admits of adjustments in the life of the region. The lifting of the ice sheet is also a slow process, and the retreat is hindered by long halts or fresh advances. The Pliocene was an age of transition; the climate grew colder, introducing the glaciations of the Pleistocene. The warm climate fauna like the woolly rhinoceros and the heavily coated mammoth changed their habits. Others wandered to the warmer regions to the South. In interglacial periods the temperate fauna and flora followed up the retreating ice, the return of the ice pushing the warm forms again to the South. Before the end of the Pleistocene the warm climate fauna all vanished from Europe, the elephant, the rhinoceros and the lion migrating to warmer regions.

EXTENSIONS IN ASIA.

The maximum glaciation of Northern Europe covered 2,000,000 sq. miles, or one half of the area covered by the ice sheets of North America. Beginning with the enlarged glaciers in the Scandinavian mountains, the glaciers expanded on the plains of Sweden and moved outwards in all directions, filling the basin of the North Sea. The Scandinavian ice made common cause with the local mountain glaciers of British Isles. Most of Russia was occupied, extending somewhat beyond the Ural mountains into Asia. Its extensions in Asia are only slowly being investigated and studied. It no doubt reached central Asia. In Turkistan Sir Aurel Stein[4] observes that shrinkage has been noticed in the sources of irrigation in historical times without the climate of the Tarim basin as a whole having undergone any appreciable change. This has been accounted for by the process of using up what has been aptly called " fossil ice ", great reservoirs of ice having been left behind by the last glacial period, which has been undergoing slow but more or less continuous reduction through milder climatic conditions. The extension to the Himalayas and the Kashmir Valley has been investigated first by the Italian expedition to the Himalayas led by Dainelli, and later by the Yale Cambridge Expedition in the Kashmir Valley.

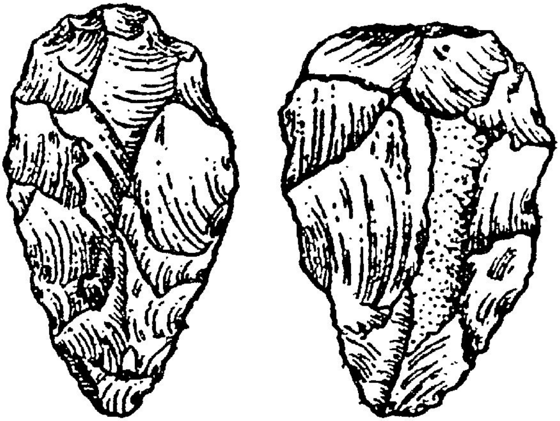
Before dealing with Asia, we shall first consider the situation in Europe. Inter-glacial beds have been found in England, Germany, Denmark and Russia. During these inter-glacial periods, the climate was comparatively warm and more or less equable. Four glaciations with their interglacial

[4] Aurel Stein, M. Ancient Khotan, Oxford, 1907, Volume I. Text: Section I, p. 95 and Section 7, pp. 383–388.

periods have been worked out by Penck and Bruckner, the Gunz, Mindel, Riss and Wurm, after the names of the valleys in which evidences of their existence have been found.

INTER-GLACIAL STAGES AND PALAEOLITHIC CULTURE PHASES.

The first glacial stage was not very widespread covering the Alps and extending into North Germany across the Baltic Sea. It did not reach Great Britain. In the earliest phases of the Ice Age, there appears to have been little or no advance upon the Pliocene and the Miocene eoliths. The first or the Gunz-Mindel Inter-glacial, was a period of temperate climate. Forms of early human forms who probably lived in this age, are represented by the Heidelberg Man in Germany. The culture of the period is termed Chellean (from Chelles on the Marne in France) the characteristic implement being the *Coup-de-poing*, or the hand axe, a long pointed tool with a rough rounded butt for a firm grip, with the other end chipped into a tapering point (Text Fig. 1).



Text Fig. I.

In succession to and closely following the Chellean culture, came the Acheullean (from the type site St. Acheul in France) in which the implement evolved further, the broad ovate form tending to develop and become the most dominant type In the Acheullean, the climate changed to sub-Arctic conditions and men took shelter in caves. The Chellean and the Acheullean core-tool cultures seem to have entered western Europe by way of Spain from North Africa.

In the second or Mindel glaciation, the Scandinavian ice fields extended further, closing the North Sea and reached Great Britain. The second inter-glacial was a very long and warm period favourable to the large African and Asiatic mammals. No evidence is found of human life in the caves. Possibly, the Acheullean continued to live in the river valleys, or beds.

In the Third or Riss glacial stage, the glaciers advanced covering Scandinavia, North Germany and Great Britain. The climate in the river valleys was however less rigorous. There was still no signs of cave life.

The Third inter-glacial stage or Riss-wurm inter-glacial, opened with a warm climate favourable to the surviving mammals, but changing gradually to cold dry steppe climate. Early Mousterians probably lived in this period, living in the open, gradually resorting to life in caves.

The Fourth or Wurm glacial stage saw the Neanderthal Race well developed and taking to life in the caves, from where all their skeletal remains and evidences of culture have been obtained.

The Neanderthal man so called from the first specimen discovered in 1857 in a cavern in the Neanderthal in Germany, is known also as the Mousterian Man, from the cavern of Le Moustier in the Dordogne, in France. The earlier Heidelberg race found in Germany is considered to be ancestral to the Neanderthal.

The Mousterian man brought about a complete change in the industry of making stone implements, gradually giving up core implements and concentrating on flake tools, the implements being considerably specialized having a number of characteristics different from either those which preceeded them or those that came after.

With the closing stages of the glacial epoch there is evidence of a different culture, indicating the arrival of fresh invaders. The Aurignacian man is altogether different from the Mousterian With the coming of the Aurignacian, the general type of culture varies, indicating the first appearance of the Cro-Magnon race or the first race belonging to the type of modern man. There still is a greater tendency for the occupation of the caves and rock shelters. There seems to have been a wave of migration of peoples from North African coast which combined with the prevailing culture produced the general Aurignacian culture.

Later migrations of people, this time from the East introduced the instrusive culture named the Solutrean from Solutre in France. This culture probably originated in Asia and spread over to Europe. The invaders did

not exterminate the Aurignacian, who must have been partly absorbed by them, producing the Solutrean culture roughly 30,000 years ago. The flint making industry now reaches its highest degree of technique. We have blades of large size shaped like a leaf, thin core implements very delicately made. This phase marks a revival of the core industry.

We now pass on to the Magdalenean culture, in the region of the Pyrennes, and culturally closely akin to the Aurignacian. It was presumably a locally developed culture and not one introduced from without. Specialised attention was paid to the implements of bones, ivory and reindeer antler, harpoons and spear heads of bone. As an inheritance from the Aurignacian, art was practised on a large scale, producing extremely remarkable and artistic representations of animal forms, dating back to about 25,000 years ago. Sculptures are also found in bone or antlers, and occasionally in clay, forming very realistic representation of animal forms—portrayal of animals on which they were dependent upon for their means of livelihood.

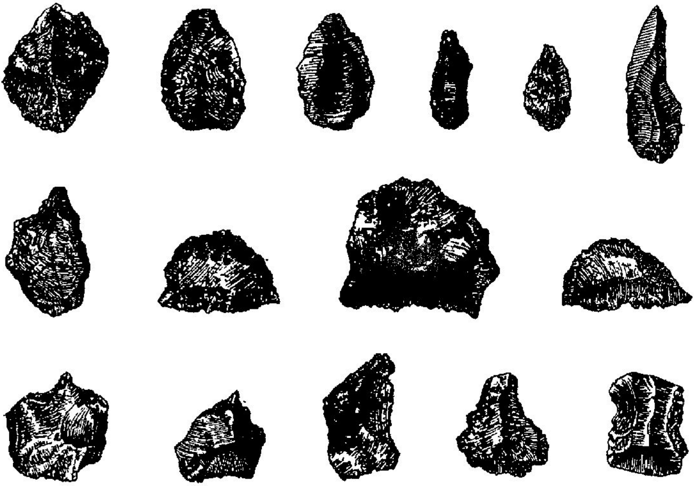
Palaeolithic culture culminates with the end of the Magdalenean phase, with the Arctic fauna still existing in the South of Europe. A very marked change comes at the end of this period, very considerable changes inaugurating a temperate climate, which remains very much that of the present day, with quite a different culture. Great changes were also taking place in the configuration of the continent, and Great Britain lost her land connection with the continent, thus becoming an island.

THE MESOLITHIC.

We have now traced in brief the prehistoric period of Europe down to the post-glacial times. For a long time there was a kind of hiatus existing between the Old and New Stone Age cultures, so abrupt a change as though Paleolithic man vanished into thin air, introducing quite a new culture, the culture of the polished Stone Age.

In more recent times, it is evident that between the Paleolithic and Neolithic, there are certain intervening cultures, collectively known as the Mesolithic, the beginnings of which have been roughly reckoned to be about 10,000 years ago. I may mention here one of these constituent cultures, namely the Capsian, of North named after Gafsa in Southern Tunis The later development of the Capsian culture extended north-ward into France. Belgium and Great Britain. The miniature type of flint implements, known as pigmy flints or as Tardenoisian, from Tradenois a site in France, is considered to be a development of the Capsian culture. These pigmy implements are

known to have a wide distribution, in India among other countries, though their use has largely been a matter of conjecture. (Text Fig. II.)



Text Fig.

The Neolithic culture which was advancing brought about thorough going changes in the life of the people. Neolithic man was largely pastoral with a food supply rendered easy by domestication of animals. Pastoral habits imply an element of sedantarism, with tendency to remain in one spot, while it also involved migration to fresh pastures.

These people were not only herdsmen, they were also cultivators, involving settled habits even more than the pastoral life. This increase of habits of settled life led to the inevitable tendency to group together in communities. When there is an aggregation in communities, it is no longer essential for each individual to be self supporting, and progress was rapid. The bearers of this advanced culture which marked the first steps in modern civilisation are considered to have arrived either from Asia or by way of South from the Mediterranean regions of North Africa. The evidence tends to favour the view that it probably arose in the East, and migrated into western European by way of the Mediterranean.

Here perhaps we may close our review of the prehistoric periods of Europe.

GLACIATIONS AND PREHISTORIC CULTURES IN ASIA.

Coming to conditions in Asia what do we find? In place of the sequence of prehistoric cultures so clearly established for Europe, we have mere glimpses of conditions in Asia which do not tell a connected tale, except for the exploration of the Indus Valley which have yielded the well established Mohenjodaro culture; the recent Yale-Cambridge Expedition to the Kashmir Valley and investigations by H. D. Sankalia, V. D. Krishnaswami and others into the prehistory of Deccan.

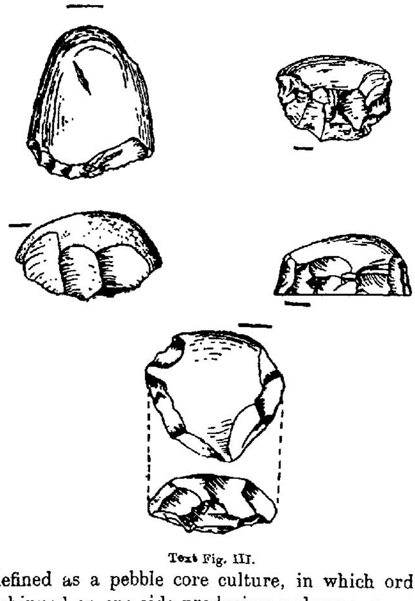
The first efforts at investigating the problem of the Pleistocene glaciations in India were directed by Dr. de Filippi's expedition to the Himalayas, the Karakoram and Chinese Turkistan during 1913-14. Giotto Dainelli of this expedition investigated two distinct areas (1) The Upper Indus and its tributaries comprising the territories of Baltistan and Ladak and (2) the Basin of Kashmir. The expedition made a general survey of the glacial period in these two districts. The general result of the work on the glaciology of the districts goes to prove the former greater extension of glaciation in the Upper Indus Valley and the Kashmir basin. Dainelli made a study of the lakes of the Upper Indus lying between its confluence with the Gilgit on the west and plains of Kashmir on the east. Many of these lakes are morraine dammed, and some of the larger ones, he considers to have originated by glacial excavation. During the Pleistocene glacial period, the ice advanced until it covered the whole of the Upper Indus Valley, as far as its confluence with Gilgit. Dainelli's researches on the glacial deposits of the Upper Indus led him to recognise four successive expansions of the ice, followed by others of less intensity. During the first extension most of the valleys were invaded by ice, whereas in the later stages, the Indus Valley and most of the zone of the high plateau were free from ice. The first advance was more intense than the second, the third though less so, was more intense than the fourth. Dainelli estimates that over 100,000 square kilometres in the Upper Indus as the extent of the surface occupied at the maximum glaciation. The first extension is correlated by Dainelli with the Mindel period in the Alps, the second with the Riss, the third Wurm, the fourth corresponding to the post-Wurmian extension in the Alps. Dainelli considers it certain that the glaciers on the Himalayan slopes of Kashmir extended to the plains of Kashmir.

Dr Hellmut de Terra led three expeditions to the North-West India which has considerably added to our knowledge of the geology of the region and the stratigraphy of the Pliocene-pleistocene sequence [5] During his last expedition

[5] De Terra and Paterson T. T.—" Yale-Cambridge Expedition in the Kashmir Valley and in the foot hills of the South West Himalayas ; Report on the Ice Age in India and the Associated Human Culture "—1939.

which concluded a season's work in the summer of 1936, he carried out investigations in the stretch of the country between the River Indus and Jhelum and extending from the Kashmir valley across the Pir Panjal range and Poonch to the Salt Range. De Terra besides upholding Dainelli's conclusions of two major expansions of the ice and at least four minor ones, noticed the formation of five boulder terraces in the Indus and Soan river valleys linked with the last two major glaciations and inter glacial periods, and a minor late glacial ice advance. De Terra found the stratigraphical sequence in India similar to the stratigraphy of the Pleistocene of Europe. The main divisions of the Pleistocene are based on paleontological considerations. The interesting fact established is the similarity between Europe and the Kashmir region in the stratigraphical sequence, all the four glaciations from Gunz to Wurm having been found.

How far the stratigraphical parallel corresponds to a culture parallel is a matter for further investigation. The cultures that are met with on the different terraces are all progressive modifications of the most primitive Soan



Text Fig. III.

which is best defined as a pebble core culture, in which ordinary pebbles of handy size are chipped on one side producing a sharp wavy edge with a large portion of the unflaked pebble to give a good grip—a new series midway between a pebble culture and a core culture (Text. Fig. III). When the different

cultures made out by the Yale Expedition are correlated to the different terrace formations, a sound geological chronology is expected to be provided for the pre-history of this region. The Soan culture as the culture has been named by de Terra, is expected to provide the key to the solution of the Stone Age culture of North India and possibly of the South.

The roots of the Pleistocene are to be found in the rich Siwalik fauna and also in the Narbada fauna. The general fact stands out that just as Europe has the Ice Age of the Pleistocene which is in reality a concatentation of oscillations, so in the North West of India the glacial deposits like boulder clay overlie a very late Pliocene fauna, and a series of glaciations and interglacial periods have been worked out.

Dr. Teilhard de Chardin who co-operated with de Terra has also worked out the Narbada valley and the Central Provinces *. It is expected that some of the problems of Indian Pleistocene will have been solved in the process giving a basis for further work on them. The Soan culture appears to be contemporary with the Acheulio-Mousterian cultures. It appears to have a wider range extending into the Upper Palaeolithic times, whereas European cultures present several varieties of implements.

PRE-HISTORIC CULTURE OF SOUTH INDIA.

In South India, the geological history is more important along the coast line. The land within the Pleistocene appears to have slowly emerged out from the sea giving rise to a series of marine terraces. Co-extensive with the emergence of the land, the rivers such as the Cortelliar, Narnavaram and Cauvery have formed terraces. Implements have been found on the marine terraces of Alicoor and Satyavedu areas, which contain geological evidences which are likely to throw light on the different stages of the Palaeolithic history of South India. Our part of India has not been glaciated in the Pleistocene as in the Kashmir region. Some of the sites like Attirampakkam appears to have been thickly populated by the Palaeolithic peoples, judging from the enormous number of artifacts collected, since Robert Bruce Foote obtained his first Palaeolith at this site in 1863. The stone implements (Text. Figs. IV and V) discovered in the laterite beds include large numbers of implements of the type characteristic of Chellean and Achuellean of Europe. In a general way they recall Acheullean culture. Whether they relate to a period of time strictly conformable to the Palaeolithic culture of Western Europe, or whether they relate to later local culture, are questions awaiting investigation.

A type of implement has been found in the laterite beds in which the cutting edge is formed by intersections of the two large flake scars, the convergence of the two flakes producing an exceedingly keen edge. This is a definite

* De Terra H. and Teilhard De Chardin, "Observations on the Upper Siwalik formation and later Pleistocene Depsits in India"—Proceedings, American Philsophical Society, 1936.

Text Fig. IV.

Text Fig V.

type of implement which can either be a core or flake implement. This type has become a widespread one and is one of the dominant types of South Africa. The constant repetition of the form in various areas pronounces it to be more than an accident one of the important types of early palaeolithic.

Dr. Van Stein Callenfels, the great authority on the archaeology of Indonesia, referring to the discovery of the implements of Palaeolithic types in Eastern Java in October 1935 sounds a timely warning against the tendency to assign great age to the implements without convincing geological or paleaontological evidence. His observation that these implements as well as others from Malay Peninsula probably represent the oldest wave of Melanesoid civilisation which reached Java, is not without its interest to us in South India, and demands our attention. The artifacts bear a strong resemblance to the early palaeolithic types of Western Europe, as well as to those found in South India.

A culture with types like the European Palaeolithic forms are, according to Dr. Callenfels, of the components of the Melanesoid culture [7]. Typology, he continues, is not a reliable indication of age, and that the purely Chellean and Acheullean types are in all probability younger than Mesolithic He considers it probable that influence from India played a part in the development of the Melanesoid civilisation of Indonesia and that the Melanesoid lived contemporaneously with more civilised Neolithic peoples. There is no doubt that the problems raise important issues which need further investigations in relation to the early Indian races and cultures.

Dr. Von Koeningswald[8] in the course of a study of the implements from Java, similarly observes that in their general form the hand axe conforms closely to the specimens found in India near Madras. As he says, the Madrasian is a pure hand-axe culture, whereas in Java other types of implements are found as well. The long broad cleavers of Madras type, formed of two converging flakes with a broad cutting edge referred to above, is however a type unrepresented in Java. Not only therefore do the South Indian implements await further investigation with reference to the geological deposits in which they are found, they also need to be studied in relation to the finds in North India, and in comparison with those found in South Africa on the one side and the Malay Peninsula on the other, both of which areas have lessons of their own for South Indian prehistory.

We are apt to forget that the term Palaeolithic culture does not always imply the typical Palaeolithic times of the glacial epochs of the Pleistocene.

---

7 Callenfels, Van Stein "The Melanesoid civilisation of Eastern Asia"—Bulletin of the Raffles Museums, Series B. No. 1, May 1936, pp. 41–51.

8 Koeningswald Von. G. H. R., "Early Palaeolithic stone Implements from Java" Bulletin of the Raffles Museum, Series B. No. 1, May 1936.

Both in protohistoric and later times there have been peoples in a condition of arrested culture, a state of Palaeolithic culture in so far as they did not advance beyond the stage of the use of implements in stone. We must therefore exercise great caution and restraint in ascribing the stone implements of the South Indian to the Pleistocene age. While we must remember these factors that affect the problem, South India has her own local conditions which have to be considered in arriving at a correct diagnosis of the problems. The most important of these is the correlation of the laterite formations with the stone implements, which are found imbedded in them. The peoples who left the relics of their culture in the form of these implements have however left little evidence of their racial composition. If skeletal material were found in association with these implements, much of the problems relating to the ownership of these implements would have been solved.

The river terraces of South Indian rivers have to be systematically investigated. The world wide glaciations of the past ages resulted in a considerable evaporation of sea water. The sea level was consequently considerably reduced, and considerable were the geographical changes produced. Following this glacial abstraction of sea water, narrow waterways and straits were changed into dry land The similarity of fresh water fish in the rivers of the islands of Borneo and Sumatra now widely separated by sea water has been explained on Molengraff's theory of the Sunda Land. Wayland [9] has similarly attributed the presence of Palaeolithic man in Ceylon to the former connection of the Island with the Deccan. In the same way has been explained the excavation of Ceylon river channels below present sea level. The Post-glacial rise of general sea level was necessarily accompanied by a rise of the waters near the coast.

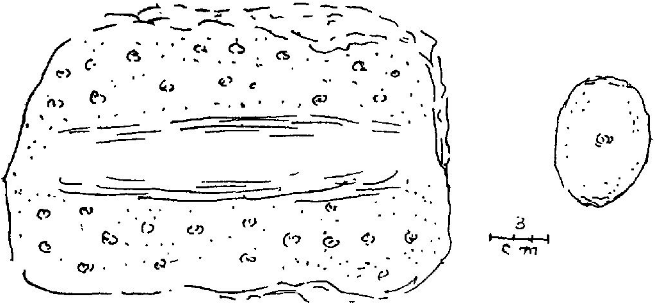
The following summary of Stone Age discoveries made in Ceylon by P.E.P. Deraniyagala [10] will be of obvious interest in this context:—

Although the existence of stone implements in Ceylon was known since 1908, there was no definite method of dating them until Shivalik fossils were discovered in 1936 in the gem sand of Sabaragamuva province. These were at times associated with stone implements that were not dissimilar to some phases of the Suwan (Sohan) culture of India. The Ceylon implements were assigned to the *Ratnapura culture* and the most important fossil associated with them was the hippopotamus *Hexaprotodon sinhaleyus*. Crude pebble artifacts and

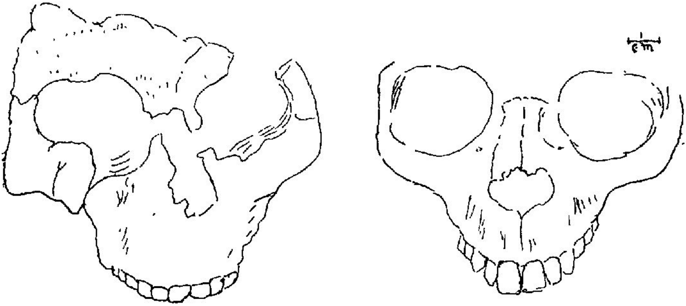
[9] Wayland, E. J., "Outlines of the Stone Age of Ceylon", Spolia Zeylanica, National Museum, Ceylon, Volume XI, 1917. "Some suggestions regarding Stone Age Research in Ceylon" Sir Paul Pieris Felicitation. Volume, Colombo 1956. Wayland, E. J., Deraniyagala, P. E. P., The Pleistocene of Ceylon, Colombo National Museum, 1958.

[10] Deraniyagala P.E.P.—*Spolia Zeylanica*, Vol. 30, Part I, pp. 1—34, and 87 147.

choppers were common, but amygdaloid weapons were scarce. The brow ridge of a human found in association with both has been termed *Homo sinhaleyus*. Both flourished during the *Lake phase* of Ceylon towards the close of the middle Pleistocene. A younger culture termed the *Balangoda culture* is better known than the Ratnapura one. The animal remains occurring in association with these artifacts belong to living species and skeletal remains of ten individuals buried in flexed attitudes in a kitchen midden at Bellan Bandi Palassa have been secured. These humans were mostly dolichocephalic and differ from the present day races of Ceylon in that in some the skull bones were thicker, the third molars were well worn, the cheek bones or molars were heavier, and the distance from the nasal opening to the incisors was nearly double that of the living humans of Ceylon. The most interesting of the stone artifacts are pebbels with one to four shallow pits each about 1 cm. in diameter upon each surface. These pebbles had been utilized as hammers. There were also flat sub-rectangular blocks of stone about two feet long, one foot wide, and eight inches deep, with fifteen to thirty such pits upon the obverse and reverse surfaces Some of these show narrow polished grooves that had been produced by grinding and polishing celts in them. Others display subcircular smooth hollows that occupy about half of the surface which appear to have been produced by grinding cereal. These slabs are termed anvil-*cum*-grind stones (Text Fig. VI) and they together with the hammers, celts and large artifacts are termed macroliths. These humans have been named *Homo Sapiens Balangodensis* (Text Fig VII) and display several Australoid characters Their open air habitation sites were about a quarter of a mile long and they had probably lived down to early historic times. Their hybridization with metal using man led to their disappearance but traces of the above mentioned characters recur in an occasional so-called Vedda. As similar pitted pebble hammer stones occur in Australia, Japan and America, it is probable that these humans had entered all three countries and Hootons identification of early Red Indian skeletons as Proto-australoid and Pre-dravidian lends much support to this view. The discovery of two teeth of a pithecanthropoid that has been named *Homopithecus sinhaleyus* is of much interest since it bridges the gap that had existed between these beings of China and Java in the east, with those of Africa in the west. The age is akin to that of *Homo sinhaleyus*



Text Fig. VI.



Text Fig. VII.

BIBLIOGRAPHY.

AIYAPPAN, A. Manley Collection of Stone Age Tools, Nellore: Memoir, Archaeological Survey of India.

AIYAPPAN, A. Mesolithic artifacts from Sawyerpuram in Tinnevely district, South India,—Spolia Zeylanica, XXIV-Pt. 2 (1945), pp. 145–154.

AUREL STEIN, M. Ancient Khotan, Oxford, 1907, Volume I. Text: Section 1, p. 95 and Section 7, pp. 383–388.

CALLENFELS, VAN STEIN. "The Melanosoid Civilisation of Eastern Asia"—Bulletin of the Raffles Museums, Series B No. 1, May 1936, pp. 41–51.

DERANIYAGALA, P. E. P The Pleistocene of Ceylon,} Colombo National Museum, 1958.

DEKANIYAOASA, P. E. P. "Spolia Zeylanica", Vol. 30, part I, pp. 1—34 and 87—147.

DE TERRA, H. & TEILHARD DE CHARDIN, P. "Observations on the Upper Siwalik formation and later Pleistocene Deposits in India"—Proceedings, American Philosophical Society, 1936.

DE TERRA & PATERSON, T T. "Yale-Cambridge Expedition in the Kashmir Valley and in the foot hills of the South West Himalayas, Report on the Ice Age in India and the Associated Human culture"—1939.

FEDDEN, FRANCIS. The Geology of the Kathiawar Peninsula in Guzerat, Memoir, Geological Survey of India, Volume XXI, p. 164.

KOENINGSWALD VON, G. H. R. "Early Paleaolithic Stone Implements from Java"—Bulletin of the Raffles Museum, Series B. No. 1, May 1936.

KRISHNASWAMI, V. D. "Environmental and cultural changes of pre-historic man near Madras"—Journal of the Madras Geographical Association, Volume XIII—1938.

KRISHNASWAMI, V D "Pre-historic Man Around Madras"—Indian Academy of Sciences, Madras, 1938.

KRISHNASWAMI, V. D. "Lithic Tools Industries of the Singrauli Basin"—Ancient India, No. 7, 1951.

KRISHNASWAMI, V. D. "Stone Age of India"—Ancient India, No. 3, 1947.

OLDHAM, R. D. "A Manual of Geology of India and Burma, Volume II, Third Edition, Revised and Enlarged by Sir Elwin Pascoe, Delhi, 1959—Ch. XXII. The Gondwana system of the Peninsular Region. I-Talchir series pp. 901–932.

SANKALIA, H. D. Vedic Age, Bharatiya Vidya Bhavan, Bombay, 1951.

SANKALIA, H. D. Indian Archaeology To-day, 1962.

SANKALIA, H. D. "Pre and Proto-history of Guzerat. The Glory that was Gurjaradesa "Journal of the Guzerat Research Society", Volume V., No. 2, April 1943—(Maharaja Solanki Mellomal Celebration Volume) Bharatiya Vidya Bhavan, Bombay.

SANKALIA, H. D. Pre-history and Proto-history of India and Pakisthan, 1962.

SANKALIA, H. D. "In Search of Early Man along the Sabarmati,"—Journal of Guzerat Research Society, Volume V, No 2, April 1943.

SANKALIA, H. D., Studies in the Pre-history of Deccan (Maharastra). "A Survey of the Gondvana and the Kadava near Niphand,"—Bulletin of the Deccan College Research Institute, Volume IV, 1943.

SANKALIA, H. D. "Investigations into Pre-historic Archaeology of Guzerat, being the official report of the First Guzerat Pre-historic Expedition, 1941–42." Memoir No. IV, Sri Pratapa Sinha Maharaja Rajybabhisheka Grantha Mala, 1941–42.

SANKALIA, H. D. "Investigations into Pre-historic Archaeology of Guzerat,"—Memoir No. IV of the Sri Pratapa Sinha Maharaja Rajyabhisheka Grantha Mala, 1946.

WADIA, D. N. Geology of India, 1938, Chapter IX—The Gondwana system. The Permian glacial epoch. p. 112, Talchir Series, from the first recognition in Talchir district of Orissa, pp.117 × 120.

WAYLAND, E. J. "Outlines of the Stone Age of Ceylon"—Spolia Zeylanica, National Museums, Ceylon, Volume XI, 1917. "Some suggestions regarding Stone Age Research in Ceylon", Sir Paul Pieris Felicitation, Volume, Colombo, 1956.